



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/615,605	07/13/2000	Iwao Higashikawa	04329.2348	4718

22852 7590 09/16/2003

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
1300 I STREET, NW
WASHINGTON, DC 20005

EXAMINER

NGUYEN, MICHELLE P

ART UNIT

PAPER NUMBER

2851

DATE MAILED: 09/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/615,605

Applicant(s)

HIGASHIKAWA, IWAO

Examiner

Michelle Nguyen

Art Unit

2851

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 13-21 is/are rejected.
- 7) ☒ Claim(s) 11 and 12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 July 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see page 5, lines 5-8, filed June 13, 2003, with respect to claim 12 have been fully considered and are persuasive. The rejection under 35 U.S.C. § 112, second paragraph, of claim 12 has been withdrawn.
2. Applicant's arguments filed June 13, 2003, with respect to the rejection under 35 U.S.C. § 103(a) of claims 1-10 and 13-20 have been fully considered but they are not persuasive.

With regard to claim 1, applicant states that examiner recognizes the failure of Hayashi to teach or suggest at least detecting a defect on a substrate (see Remarks, page 6, lines 16-7). However, examiner did not submit such recognition. Instead, examiner indicated that Hayashi does not teach *explicitly* detecting a defect on a substrate (see Office action, page 3, lines 12-3). That is, Hayashi teaches a step of detecting a lateral deviation caused by a thickness variation of a substrate, thereby effectively teaching a step of detecting a defect on a substrate (see Office action, page 3, lines 13-20). Here, the lateral deviation, which is caused by the thickness variation of the substrate, constitutes a defect on the substrate.

Applicant then argues with regard to claim 1 that the term "defect" refers to pattern error, pattern related error, and the quality of a blank, and not to lateral deviations caused by the thickness variation of a substrate. However, Hayashi explains that a lateral deviation caused by a thickness variation of a substrate, i.e. an unevenness of the surface of a substrate, arises from a manufacturing tolerance or a

manufacturing error, and so indicates that such lateral deviation is a defect of the substrate (see Col. 8, lines 55-64). Therefore, examiner maintains that a lateral deviation caused by the thickness variation of a substrate constitutes a defect of the substrate.

As to applicant's contention that examiner took Official Notice regarding the term "defect," examiner clearly pointed out that the lateral deviation caused by a thickness variation of a substrate of Hayashi read on the term "defect" (see Office action, page 3, lines 17-20). Therefore, applicant's contention is incorrect.

With regard to claims 4-7, applicant argues that examiner took Official Notice with regard to position correction of a pattern area by shifting the pattern area in the x- and/or y-directions and by swinging the pattern area by any degree. This argument is incorrect. Examiner explained that Hayashi teaches the position of a wafer to be corrected with respect to the position of a pattern area by shifting the position of the wafer in the x- and/or y-directions and by swinging the position of the wafer with respect to the position of the pattern area so that the wafer and pattern area are aligned with one another (see Office Action, page 4, lines 15-9). It would be optically equivalent to correct the position of the pattern area with respect to the position of the wafer so that the position of the wafer and the pattern area are aligned with one another. In view of such equivalence, examiner concluded in the previous Office action, and now maintains, that it would have been obvious to correct the position of the pattern area by shifting the position of the pattern area in the x- and/or y-directions and by swinging the

position of the pattern area with respect to the position of the wafer so that the wafer and pattern area are aligned with one another.

With regard to claims 9 and 18, examiner maintains the rejection set forth in the previous Office action for reasons discussed above in connection with claim 1.

With regard to claims 14-17, examiner maintains the rejection set forth in the previous Office action for reasons discussed above in connection with claims 4-7.

In view of the foregoing, claims 1-10 and 13-20 remain rejected under 35 U.S.C. § 103(a) on grounds set forth in the previous Office action, and again below.

Claim Objections

3. Claim 21 is objected to because:

- (a) In line 8, "be a defect" should be --is a defect--.
- (b) In line 8, "reflective pattern" should be --a reflective pattern--.
- (c) In line 10, "be a defect" should be --is a defect--.
- (d) In line 10, "reflective pattern" should be --a reflective pattern-- or --the reflective pattern--.
- (e) In line 10, "located surface" should be --located on the surface--.
- (f) In lines 12-14, the limitation "said defect that is located in said light shielding film and lowers the shielding is positioned in reflective pattern" is redundant (compare with lines 7-8).
- (g) In lines 12-13, "reflective pattern" should be --a reflective pattern-- or --the reflective pattern--.
- (h) In line 17, "be repaired" should be --is repaired--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 21 recites the limitation "said mask blank comprises a supporting substrate and a light reflecting film on said supporting substrate or comprises a supporting substrate, a light reflecting film on said supporting substrate, and a light shielding film formed on said reflecting film" in lines 2-4. Here the term "or" indicates that the light shielding film is an optional feature of the mask blank. However, claim 21 further limits the defect, which is positively claimed in claim 9 from which claim 21 depends, such that the defect comprises "a defect that is located in said light shielding film and lowers the shielding and be a defect in reflective pattern, and a defect that is located on a surface or bottom of said light shielding film and that is remained as a defect and lowers the reflectivity and be a defect in reflective pattern" (see lines 7-10). This limitation requires the mask blank to comprise a light shielding film. Therefore, the claim language is contradictory and does not make clear whether applicant intends to claim the light shielding film as an optional feature of the mask blank.

With further regard to the above-mentioned limitation recited in claim 21, lines 7-10, it is understood such defects which are located in and on the surface or bottom of

the light shielding film are in a reflective pattern. However, claim 21 further recites the limitation "said defect that is located surface or bottom of said light shielding film is positioned in a non-reflecting pattern" in lines 14-15. This limitation requires the defect located on the surface or bottom of the light shielding film to be in a non-reflecting pattern, which is inconsistent with the limitation recited in lines 7-10 that requires such defect to be in a reflective pattern. Claim 21 also further recites the limitation "a pattern arranging position for every defect is selected in a non-reflection pattern" in lines 15-6. This limitation requires every defect, including the defects located in and on the surface or bottom of the light shielding film, to be in a non-reflection pattern, which is also inconsistent with the limitation recited in lines 7-10 that requires such defects to be in a reflective pattern. Therefore, the claim language is contradictory and does not make clear whether applicant intends to limit the defects located in and on the surface or bottom of the light shielding film such that they are in a reflective pattern or a non-reflection pattern.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-10 and 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,015,866 to Hayashi.

With regard to claim 1, Hayashi discloses a pattern forming method in which a desired pattern (pattern area PA) is exposed on to a surface a substrate (wafer W), comprising the steps of:

detecting a lateral deviation amount of the wafer W (see Col. 7, lines 43-7, Col. 9, lines 8-14, Fig. 1);

analyzing the mutual positional relationship between the detected lateral deviation amount and the pattern area PA to be formed on the surface of the wafer W (see Col. 9, lines 8-21, Fig. 1); and

based on the result of the analysis, correcting the pattern position in the step of pattern exposing on to the surface of the wafer W with the pattern area PA (see Col. 8, lines 25-34, Col. 9, lines 15-20).

Hayashi does not teach explicitly the step of detecting a defect on the surface of the wafer W. Instead, Hayashi teaches the step of detecting a lateral deviation amount caused by a thickness variation of the wafer (see Col. 8, lines 55-64, Col. 9, lines 1-14). The thickness variation causes an unevenness of the surface of the wafer W, and, in turn, a lateral deviation, which affects adversely exposure of the surface of the wafer W with a pattern (see Col. 8, lines 55-64). The lateral deviation caused by the thickness variation therefore constitutes a defect of the surface of the wafer W; and further, the step of detecting such lateral deviation constitutes a step of detecting a defect of a substrate (see also *Response to Arguments*).

With regard to claim 2, Hayashi teaches the pattern forming method as discussed above with respect to claim 1, wherein the position of the pattern area PA is

corrected such that the lateral deviation amount is not positioned in an edge of the pattern area PA (see Col. 9, lines 15-20; It is understood that the position of the pattern area PA is corrected such that the lateral deviation amount is not positioned in any area of the pattern area PA).

With regard to claim 3, Hayashi teaches the pattern forming method as discussed above with respect to claim 2, wherein the position of the pattern area PA is corrected by shifting the position of the pattern area PA in the x- and/or y-directions (see Col. 9, lines 15-20).

With regard to claims 4-7, Hayashi does not teach explicitly the position of the pattern area PA as discussed above with respect to claim 2 to be corrected with respect to the position of the wafer W by swinging the position of the pattern area PA. Instead, Hayashi teaches the position of the pattern area PA to be corrected with respect to the position of the wafer W by shifting the position of the pattern PA in the x- and/or y-directions for aligning the pattern area PA with the wafer W (see Col. 8, lines 25-45, Col. 9, lines 15-20). However, Hayashi does teach the position of the wafer W to be corrected with respect to the position of the pattern PA by shifting the position of the wafer W in the x- and/or y-directions and by swinging (rotating) the position of the wafer W with respect to the position of the pattern area PA for aligning the wafer W with the pattern area PA (see Col. 4, lines 34-8, Col. 7, lines 63-7). It would be optically equivalent to correct the position of the pattern area with respect to the position of the wafer. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to correct the position of the pattern area of Hayashi by

shifting it in the x- and/or y-directions and by swinging it by any degree to improve the accuracy of aligning the pattern area PA with the wafer W (see also *Response to Arguments*).

With regard to claim 8, Hayashi teaches the wafer W that is to be exposed as discussed above with respect to claim 2 to be a wafer having a resist film formed thereon (see Col. 4, lines 13-20, 28-38).

With regard to claim 9, Hayashi discloses a pattern forming method in which a main surface of a mask blank (wafer W) used for preparation of a photomask is exposed in a desired pattern (pattern area PA) to form a mask pattern on the mask blank comprising the steps of:

forming position measuring marks on at least two points on a main surface of the mask blank (see Col. 7, lines 22-38);

detecting a lateral deviation amount of the wafer W and obtaining defect analysis data including at least the kind (caused by deviation amount v or thickness variation t) of the lateral deviation amount and the position of the lateral deviation amount relative to the position of the measuring marks (see Col. 7, lines 43-67, Col. 8, lines 25-34, Col. 9, lines 8-20, Fig. 1);

comparing the obtained lateral deviation amount position with the relative position of the pattern area PA that is to be formed on the wafer W so as to select the mask arranging position relative to the wafer W (see Col. 9, lines 15-20); and

measuring the position measuring mark to calculate the light exposure position and applying an exposure treatment to the selected position (see Col. 7, line 20 to Col. 9, line 20).

Hayashi does not teach explicitly the step of detecting a defect on the surface of the wafer W. Instead, Hayashi teaches the step of detecting a lateral deviation amount caused by a thickness variation of the wafer (see Col. 8, lines 55-64, Col. 9, lines 1-14). The thickness variation causes an unevenness of the surface of the wafer W, and, in turn, a lateral deviation, which affects adversely exposure of the surface of the wafer W with a pattern (see Col. 8, lines 55-64). The lateral deviation caused by the thickness variation therefore constitutes a defect of the surface of the wafer W; and further, the step of detecting such lateral deviation constitutes a step of detecting a defect of a substrate (see also *Response to Arguments*).

With regard to claim 10, Hayashi teaches the pattern forming method as discussed above with respect to claim 9, wherein the position of the pattern area PA is corrected such that the lateral deviation amount is not positioned in an edge of the pattern area PA (see Col. 9, lines 15-20; It is understood that the position of the pattern area PA is corrected such that the lateral deviation amount is not positioned in any area of the pattern area PA).

With regard to claim 13, Hayashi teaches the pattern forming method as discussed above with respect to claim 9, wherein the position of the pattern area PA is corrected by shifting the position of the pattern area PA in the x- and/or y-directions (see Col. 9, lines 15-20).

With regard to claims 14-17, Hayashi does not teach explicitly the position of the pattern area PA as discussed above with respect claim 9 to be corrected with respect to the position of the wafer W by swinging the position of the pattern area PA. Instead, Hayashi teaches the position of the pattern area PA to be corrected with respect to the position of the wafer W by shifting the position of the pattern PA in the x- and/or y- directions for aligning the pattern area PA with the wafer W (see Col. 8, lines 25-45, Col. 9, lines 15-20). However, Hayashi does teach the position of the wafer W to be corrected with respect to the position of the pattern PA by shifting the position of the wafer W in the x- and/or y-directions and by swinging (rotating) the position of the wafer W with respect to the position of the pattern area PA for aligning the wafer W with the pattern area PA (see Col. 4, lines 34-8, Col. 7, lines 63-7). It would be optically equivalent to correct the position of the pattern area with respect to the position of the wafer. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to correct the position of the pattern area of Hayashi by shifting it in the x- and/or y-directions and by swinging it by any degree to improve the accuracy of aligning the pattern area PA with the wafer W (see also *Response to Arguments*).

With regard to claim 18, Hayashi discloses an exposure apparatus comprising:

- means (illumination light IL) for exposing a substrate surface (surface of wafer W) with a desired pattern (pattern area PA of reticle R) (see Fig. 1);
- means (horizontal position detecting system 11) for detecting a lateral deviation amount of the wafer W (see Col. 7, lines 43-7, Col. 9, lines 8-14, Fig. 1);

means (main controller 10) for analyzing the mutual positional relationship between the lateral deviation detected by the horizontal position detecting system 11 and the pattern area PA that is to be formed on the surface of the wafer W (see Col. 9, lines 8-21, Fig. 1); and

means (main controller 10, actuator unit 13) for correcting the position of the pattern area PA in the step of exposing the surface of the wafer W with the pattern based on the result of the analysis (see Col. 8, lines 25-34, Col. 9, lines 15-20).

Hayashi does not teach explicitly the step of detecting a defect on the surface of the wafer W. Instead, Hayashi teaches the step of detecting a lateral deviation amount caused by a thickness variation of the wafer (see Col. 8, lines 55-64, Col. 9, lines 1-14). The thickness variation causes an unevenness of the surface of the wafer W, and, in turn, a lateral deviation, which affects adversely exposure of the surface of the wafer W with a pattern (see Col. 8, lines 55-64). The lateral deviation caused by the thickness variation therefore constitutes a defect of the surface of the wafer W; and further, the step of detecting such lateral deviation constitutes a step of detecting a defect of a substrate (see also *Response to Arguments*).

With regard to claim 19, Hayashi teaches the exposure apparatus as discussed above with respect to claim 18, wherein:

the horizontal position detecting system 11 includes a laser light source (light source 11a) and a defect detector (photo sensitive element 11) (see Fig. 1);

the main controller 10 consists of a defect detecting-defect position calculating section (see Col. 9, lines 8-20);

the means for correcting the position of the pattern area PA in the step of exposing the surface of the wafer W with the pattern consists of a pattern arrangement shift treating section (see Col. 9, lines 15-20, Fig. 1).

With regard to claim 20, Hayashi teaches the main controller 10 as discussed above with respect to claim 19 to perform at least one of shifting of the position of the pattern area PA in an x- and/or y-directions and a swinging of the pattern area PA position (see Col. 9, lines 15-20).

Allowable Subject Matter

8. Claims 11 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. Claim 21 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter:

With regard to claim 21, the prior art does not teach in combination with all other limitations set forth in the claim a pattern arranging position selected such that a defect that is located on the surface or bottom of a light shielding film and lowers the reflectivity is positioned in a non-reflection pattern.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Nguyen whose telephone number is 703-305-2771. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Russ Adams can be reached on 703-308-2847. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4900.

mpn


RUSSELL ADAMS
SENIOR PATENT EXAMINER
TECHNOLOGY CENTER 2800